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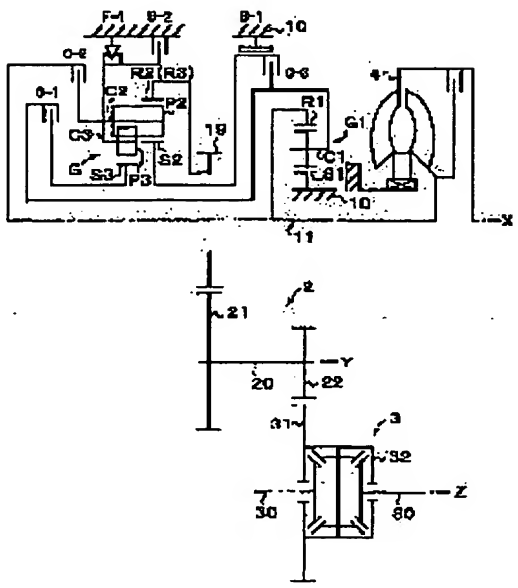
(54) VEHICLE AUTOMATIC TRANSMISSION

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the weight of a transmission mechanism and form the transmission in a compact manner by shortening a high torque transmission system and to reduce the occurrence of a shift shock due to reduction of inertia torque, in a multistage automatic transmission for a vehicle.
SOLUTION: A vehicle automatic transmission comprises a planetary gear set G to output a plurality of kinds of shift rotation as deceleration rotation and non-deceleration rotation; a deceleration planetary gear G1; an input shaft 11 on the inner peripheral side of the planetary gear set; first and third clutches C1 and C3 disengageably engaged with two different shift elements S2 and S3, respectively, of the planetary gear set through a deceleration planetary gear; and a second clutch C2 having an input shaft disengageably engaged with other shift elements C2 (C3) of the planetary gear set. A deceleration planetary gear and a third clutch to transmit high torque are arranged on one side of the planetary gear set and the first clutch C1 to transmit high torque is arranged on the other side thereof.



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CLAIMS

[Claim(s)]
[Claim 1] The planetary-gear set which outputs two or more gear change rotations by considering moderation rotation and non-slowing down rotation as an input, The moderation planetary gear put in order and arranged by this planetary-gear set and shaft orientations, In the automatic transmission for cars equipped with the input shaft which passes along the inner circumference side of a planetary-gear set, and the 1st and 3rd clutches which connect this input shaft with two different gear change elements of a planetary-gear set respectively free [engaging and releasing] through moderation planetary gear The automatic transmission for cars characterized [at the one side of said planetary-gear set] by having arranged the 1st clutch, respectively moderation planetary gear, the 3rd clutch, and the other side.
[Claim 2] The output element of said moderation planetary gear is the automatic transmission for cars according to claim 1 connected with the 1st clutch through the inner circumference of a planetary-gear set.
[Claim 3] Said planetary-gear set is equipped with at least four gear change elements. The 1st gear change element It connects with moderation planetary gear free [engaging and releasing] with the 1st clutch. The 2nd gear change element While connecting with moderation planetary gear free [engaging and releasing] with the 3rd clutch, a stop in a change gear case is enabled by the 1st stop means. The 3rd gear change element The automatic transmission for cars according to claim 1 or 2 with which the stop in a change gear case was enabled by the 2nd stop means, and the 4th gear change element was connected with the output member while connecting with the input shaft free [engaging and releasing] with the 2nd clutch.
[Claim 4] The clutch drum of said 1st clutch is an automatic transmission for cars according to claim 1, 2, or 3 which turned the opening side to the planetary-gear set side, and was made to connect with the output member of moderation planetary gear, and has been arranged.
[Claim 5] It is the automatic transmission for cars according to claim 1, 2, or 3 with which the friction material of said 3rd clutch has been arranged at the periphery of moderation planetary gear, and the clutch drum of the 3rd clutch was connected with the input member to a planetary-gear set.
[Claim 6] It is the automatic transmission for cars according to claim 5 with which said moderation planetary gear were always fixed in the boss section by which total material was carried out from the change gear case in the one element, and the hydraulic servo of the 3rd clutch has been arranged on the boss section of the one side of moderation planetary gear.
[Claim 7] It is the automatic transmission for cars according to claim 1, 2, or 3 with which the hydraulic servo of said 3rd clutch has been arranged on the input shaft of the other side of moderation planetary gear, and the clutch drum of the 3rd clutch was connected with the output member of moderation planetary gear.
[Claim 8] The friction material of said 3rd clutch is an automatic transmission for cars according to claim 7 arranged at the periphery side of the hydraulic servo of the 3rd clutch.
[Claim 9] The 2nd clutch which connects an input shaft with other gear change elements of a planetary-gear set free [engaging and releasing] is an automatic transmission for cars according to claim 1, 2, or 3 arranged to the 1st clutch or 3rd clutch at the other side of a planetary-gear set.
[Claim 10] Said friction material of the 1st - the 3rd clutch is an automatic transmission for cars according to claim 9 arranged at the periphery of other rotation members.
[Claim 11] The friction material of said 1st clutch is an automatic transmission for cars according to claim 10 with which the friction material of the 2nd clutch had been arranged at the periphery of the hydraulic servo of the 1st clutch, and the friction material of the 3rd clutch has been arranged on the periphery of moderation planetary gear at the periphery of a planetary-gear set.
[Claim 12] The automatic transmission for cars according to claim 11 with which the hydraulic servo of the 2nd brake has been arranged at the periphery of the hydraulic servo of said 2nd clutch.

[Claim 13] It is the automatic transmission for cars according to claim 11 with which differential equipment has been arranged in the location where the differential-gear ring wheel laps with the periphery of the hydraulic servo of the 3rd clutch, and the friction material of the 3rd clutch at shaft orientations by using said automatic transmission for cars as the horizontal-type change gear which has differential equipment.
[Claim 14] For a before side, the 1st clutch, and the 2nd clutch, the 3rd clutch and moderation planetary gear are an automatic transmission for cars according to claim 9 with which it has been arranged at the backside and the 1st brake has been arranged at the periphery of the 3rd clutch to said planetary-gear set.
[Claim 15] Said 1st brake is the automatic transmission for cars according to claim 14 used as the band brake.
[Claim 16] It is the automatic transmission for cars according to claim 9 with which the oilway and lubricating oil way to said hydraulic servo of the 3rd clutch were opened for free passage by the oilway within the case of one case wall, and the oilway to the hydraulic servo of the 1st clutch and the 2nd clutch was opened for free passage by the oilway within a case of the case wall of another side, respectively.
[Claim 17] The automatic transmission for cars according to claim 1, 2, or 3 with which it had the counter gear which output the output of said planetary-gear set to other shafts, and these counter gear have been arranged between a planetary-gear set and the 3rd clutch.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to arrangement of each change gear component in the gear train especially about the automatic transmission carried in a car.
[0002]
[Description of the Prior Art] The automatic transmission made to carry in a car has the request of multistage-izing for improvement in fuel consumption indispensable not only to reservation of drivability but energy saving. In order to respond to such a request, much more reduction of the number of gear change elements per number of speeds of a gear train, and the clutch and the number of brakes is needed. Then, the gear train which attains advance 6 ** and the go-astern 1st speed is proposed in JP,4-219553,A in three clutches and two brakes which operate it using the planetary-gear set which consists of the minimum gear change element. The gear train concerning this proposal makes engine power rotation and the rotation which slowed it down input into the planetary-gear set which consists of four gear change elements of a change gear suitably using three clutches as rotation from which two rates differ, and multistage 6 ** are attained by carrying out stop control of the two gear change elements in two brakes.
[0003]
[Problem(s) to be Solved by the Invention] 6 ********** of the above-mentioned conventional technique need two clutches which transmit the input slowed down through moderation planetary gear as the description to two gear change elements with which planetary-gear sets differ, respectively. While the gear ratio of good 6 ** is obtained by making it such a configuration, in order to transmit the torque amplified by moderation, reservation of the torque capacity of a these two clutches and the power transfer member of those, i.e., a high torque-transmission system, is needed.
[0004] Moreover, on the property of a gear train, since these two moderation rotation input clutches carry out high-speed rotation by the gear ratio, in order to make high torque transmit from the above-mentioned reason, they must be further made into high rigidity from the field which shall be equal to high-speed rotation. Since this point was summarized into one side to the planetary-gear set with the conventional technique and two moderation rotation input clutches are arranged, it considers as the structure where the member which connects one [those] clutch and planetary-gear set passes along the periphery of the clutch of another side. And since the centrifugal force by high-speed rotation will become still larger if such a member is arranged on the periphery of the clutch of another side, much more rigid reservation of the member which connects one clutch and planetary-gear set will be needed, and it will become greatly and heavy.
[0005] Moreover, high torque is transmitted in this way, if the member rotated with a planetary-gear set becomes for a long time and heavy, since the part inertia torque will become large, a gear change controllability gets worse, and a gear change shock is influenced.
[0006] This invention is made in view of such a situation, is ** which devises arrangement of two moderation rotation input clutches [as opposed to a planetary-gear set for enlargement of the device accompanying multistage-izing], and aims at offering the automatic transmission for cars which avoided the high torque-transmission system a light weight and by miniaturizing, mainly combined it, and aimed at improvement in a gear change controllability.
[0007]
[Means for Solving the Problem] The planetary-gear set which this invention considers moderation rotation and non-slowing down rotation as an input, and outputs two or more gear change rotations in order to attain the above-mentioned purpose, The moderation planetary gear put in order and arranged by this planetary-

gear set and shaft orientations, In the automatic transmission for cars equipped with the input shaft which passes along the inner circumference side of a planetary-gear set, and the 1st and 3rd clutches which connect this input shaft with two different gear change elements of a planetary-gear set respectively free [engaging and releasing] through moderation planetary gear It is characterized by having arranged the 1st clutch at moderation planetary gear, the 3rd clutch, and the other side at the one side of said planetary-gear set, respectively.

[0008] As for the output element of said moderation planetary gear, in the above-mentioned configuration, it is effective to consider as the configuration connected with the 1st clutch through the inner circumference of a planetary-gear set.

[0009] In the above-mentioned configuration furthermore, said planetary-gear set It has at least four gear change elements. The 1st gear change element It connects with moderation planetary gear free [engaging and releasing] with the 1st clutch. The 2nd gear change element While connecting with moderation planetary gear free [engaging and releasing] with the 3rd clutch, a stop in a change gear case is enabled by the 1st stop means. The 3rd gear change element While connecting with an input shaft free [engaging and releasing] with the 2nd clutch, it is effective to take the configuration in which the stop in a change gear case was enabled by the 2nd stop means, and the 4th gear change element was connected with the output member.

[0010] Moreover, as for the clutch drum of said 1st clutch, in the above-mentioned configuration, it is effective to consider as the configuration which turned the opening side to the planetary-gear set side, and was made to connect with the output member of moderation planetary gear, and has been arranged.

[0011] Moreover, in the above-mentioned configuration, the friction material of said 3rd clutch is arranged at the periphery of moderation planetary gear, and, as for the clutch drum of the 3rd clutch, it is effective to take the configuration connected with the input member to a planetary-gear set.

[0012] And said moderation planetary gear are always fixed in the boss section by which total material was carried out from the change gear case in the one element, and, as for the hydraulic servo of the 3rd clutch, it is effective to take the configuration arranged on the boss section of the one side of moderation planetary gear.

[0013] Or the hydraulic servo of said 3rd clutch is arranged on the input shaft of the other side of moderation planetary gear, and the clutch drum of the 3rd clutch is good also as a configuration connected with the output member of moderation planetary gear.

[0014] Moreover, as for the friction material of said 3rd clutch, it is also effective to consider as the configuration arranged at the periphery side of the hydraulic servo of the 3rd clutch.

[0015] Furthermore, as for the 2nd clutch which connects an input shaft with other gear change elements of a planetary-gear set free [engaging and releasing], it is effective to take the configuration arranged to the 1st clutch or 3rd clutch at the other side of a planetary-gear set.

[0016] Moreover, as for said friction material of the 1st - the 3rd clutch, it is effective to take the configuration arranged at the periphery of other rotation members.

[0017] As for the friction material of said 1st clutch, it is more specifically effective in the periphery of a planetary-gear set to take the configuration by which the friction material of the 2nd clutch had been arranged at the periphery of the hydraulic servo of the 1st clutch, and the friction material of the 3rd clutch has been arranged at the periphery of moderation planetary gear.

[0018] Furthermore, it is effective to take the configuration by which the hydraulic servo of the 2nd brake has been arranged at the periphery of the hydraulic servo of said 2nd clutch.

[0019] Moreover, when said automatic transmission for cars is used as the horizontal-type change gear which has differential equipment, as for differential equipment, it is effective to take the configuration arranged in the location where the differential-gear ring wheel laps with the periphery of the hydraulic servo of the 3rd clutch and the friction material of the 3rd clutch at shaft orientations.

[0020] Moreover, as for the 3rd clutch and moderation planetary gear, it is also effective to take the configuration by which a before side, the 1st clutch, and the 2nd clutch have been arranged to said pre NETARI gear set at the backside, and the 1st brake has been arranged at the periphery of the 3rd clutch.

[0021] Moreover, as for said 1st brake, considering as a band brake is also effective.

[0022] Moreover, the oilway and lubricating oil way to said hydraulic servo of the 3rd clutch are opened for free passage by the oilway within the case of one case wall, and, as for the oilway to the hydraulic servo of the 1st clutch and the 2nd clutch, it is also effective to take the configuration opened for free passage by the oilway within a case of the case wall of another side, respectively.

[0023] Moreover, when it has the counter gear which output the output of said planetary-gear set to other

shafts, it is effective that these counter gear take the configuration arranged between a planetary-gear set and the 3rd clutch.
[0024]
[Function and Effect of the Invention] With the configuration of the claim 1 above-mentioned publication, since the 1st clutch and 3rd clutch are arranged on both sides of a planetary-gear set, the die length of the transfer member from the 1st clutch and 3rd clutch to the gear change element of a planetary-gear set can be made into the shortest. Since lightweight-ization of a change gear can be performed since the member which transmits by this the high torque rotated with a planetary-gear set is made short, and inertia can be made small, a gear change controllability improves.
[0025] Next, with a configuration according to claim 2, it can connect with a compact by connecting the output member of moderation planetary gear with the 1st clutch through the inner circumference of a planetary-gear set. Moreover, since a high torque-transmission member is not major-diameter-ized, while a centrifugal force becomes small and being able to carry out [part lightweight]-izing, since inertia can be made small, a gear change controllability improves.
[0026] And 6 ********** which attain the above-mentioned effectiveness are realizable with the small number of gear change elements with a configuration according to claim 3.
[0027] Next, with a configuration according to claim 4, since the clutch drum of the 1st clutch can be arranged without other members on an input shaft by connecting the clutch drum of the 1st clutch with the output member of moderation planetary gear, a seal ring indispensable to ****** of the supply oilway of the oil pressure to the hydraulic servo in this drum can be lessened.
[0028] Moreover, with a configuration according to claim 5, the axial length of a change gear can be shortened by arranging friction material on the periphery of moderation planetary gear.
[0029] Furthermore, with a configuration according to claim 6, a seal ring can be lessened by arranging a hydraulic servo on the boss section of a change gear case. Moreover, since the member for fixing one element of moderation planetary gear and the member for reservation of the oilway to the 3rd clutch are communalized, a change gear can be miniaturized.
[0030] Next, with a configuration according to claim 7, since the direct arrangement of the hydraulic servo of the 3rd clutch can be carried out on an input shaft, a seal ring indispensable to ****** of the supply oilway of the oil pressure from an input shaft to a hydraulic servo can be lessened.
[0031] Furthermore, with a configuration according to claim 8, the axial length of a change gear can be shortened by arranging friction material and a hydraulic servo in piles.
[0032] Next, with a configuration according to claim 9, since the 2nd clutch does not intervene between the 1st clutch or the 3rd clutch, and a planetary-gear set, the member which connects the 1st clutch or 3rd clutch, and planetary-gear set can be shortened.
[0033] And with a configuration according to claim 10, by arranging each friction material of the 1st - the 3rd clutch on the periphery of other rotation members, since the shaft-orientations tooth spaces for friction material arrangement are reducible, the axial length of a change gear can be shortened.
[0034] Furthermore, the axial length of a change gear can be shortened with a configuration according to claim 11, arranging the friction material of each clutch near each hydraulic servo.
[0035] And with a configuration according to claim 12, since the hydraulic servo of the 2nd brake can be arranged without the periphery side of the 2nd clutch taking the direction arrangement tooth space of a real arm shaft horizontal, much more compaction of change gear axial length is attained.
[0036] Next, when it constitutes a change gear equipped with DIFARENSHA equipment from a configuration according to claim 13, interference with the differential-gear ring wheel of a major diameter and a change gear style can be prevented, and the degree of freedom of a differential-gear ratio setup can be made high.
[0037] Moreover, with a configuration according to claim 14, since the 1st brake can be arranged on the periphery of the 3rd clutch and it is not necessary to complicate management of the 1st brake, a change gear is made into a compact.
[0038] And with a configuration according to claim 15,-izing of the change gear can be carried out [minor diameter] by using the 1st brake as a band brake.
[0039] Furthermore, with a configuration according to claim 16, since an oilway can be arranged with balance sufficient in a change gear case, concentration of the oilway within a case can be avoided and the design degree of freedom of an oilway improves.
[0040] Next, with a configuration according to claim 17, by arranging counter gear between a planetary-gear set and the 3rd clutch, when considering a change gear as a counter-gear output, a planetary-gear set can be

adjoined and the 1st clutch can be arranged. Since the 1st clutch carries out high-speed rotation compared with the 3rd clutch, it can perform lightweight-ization of a change gear by making into the shortest the member which carries out high-speed rotation, and its gear change controllability also improves.
[0041]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained along with a drawing. Drawing 1 develops between shafts in a common flat surface, and shows the gear train of the 1st operation gestalt of the automatic transmission for cars which materialized this invention by the skeleton. Moreover, drawing 2 shows actual axial physical relationship for the above-mentioned automatic transmission, in view of an end face. Let this automatic transmission be the horizontal type transformer axle of 3 shaft configurations by which each element was arranged on each shaft of the main shaft X which is mutually concurrent, the counter shaft Y, and the differential-gear shaft Z. The planetary-gear set G which the change gear style on a main shaft X considers moderation rotation and non-slowing down rotation as an input, and outputs two or more gear change rotations The moderation planetary gear G1 put in order and arranged by the planetary-gear set G and shaft orientations, The input shaft 11 which passes along the inner circumference side of the planetary-gear set G, and the 1st and 3rd clutches (C-1, C-3) which connect an input shaft 11 with two different gear change elements S3 and S2 of the planetary-gear set G respectively free [engaging and releasing] through the moderation planetary gear G1, It has the 2nd clutch (C-2) which connects an input shaft 11 with other gear change elements C2 (C3) of the planetary-gear set G free [engaging and releasing].
[0042] The planetary-gear set G is equipped with four gear change elements S2, S3, C2 (C3), and R2 (R3). The 1st gear change element S3 It connects with the moderation planetary gear G1 free [engaging and releasing] with the 1st clutch (C-1). The 2nd gear change element S2 While connecting with the moderation planetary gear G1 free [engaging and releasing] with the 3rd clutch (C-3) A stop in the change gear case 10 is enabled by the 1st stop means (B-1). The 3rd gear change element C2 (C3) While connecting with an input shaft 11 free [engaging and releasing] with the 2nd clutch (C-2), a stop in the change gear case 10 is enabled by the 2nd stop means (B-2), and the 4th gear change element R2 (R3) is connected with the output member 19. In addition, although the brake (B-2) was made to stand in a row and the one-way clutch (F-1) is arranged in the gear train shown in drawing This avoids the complicated oil pressure control for a hold substitute of the brake at the time of the 1 ->2 gear change described minutely later (B-2), and a brake (B-1). It is [that release control of a brake (B-2) should be simplified] equivalent to a brake (B-2) using the one-way clutch (F-1) which releases the engagement force naturally with engagement of a brake (B-1).
[0043] Hereafter, the gear train of this operation gestalt is further explained to a detail. On the main shaft X, the torque converter 4 with a lock-up clutch which transmits rotation of the engine which is not illustrated to an input shaft 11 is arranged. Counter gear 2 are arranged on the counter shaft Y. Counter gear 2 achieve the function which is fixed to the counter shaft 20, is made to reverse while the counter driven gear 21 of the major diameter which gears on the counter drive gear 19, and the differential-gear drive pinion gear 22 of a minor diameter which is similarly fixed to the counter shaft 20 and gears to the differential-gear ring wheel 31 are arranged and slowing down the output from a main shaft X side by these, and is transmitted to differential equipment 3. Differential equipment 3 is arranged on the differential-gear shaft Z. It fixes to the differential-gear ring wheel 31, and a differential case 32 is established, and differential rotation of the differential gear arranged in it is outputted to a lateral axis 30, and let differential equipment 3 be final wheel driving force.
[0044] It consists of RABINIYO-type gear sets which consist of a carrier C2 (C3) with which the planetary-gear set G gears with the sun gears S2 and S3 of a pair with which the diameters of size differ mutually, and supports the pinion gears P2 and P3 of a pair with which another side gears to the sun gear S3 of a minor diameter by gearing to a ring wheel R2 (R3) while one side gears to the sun gear S2 of a major diameter. And with this gestalt, the 1st gear change element and the sun gear S2 of a major diameter are used as the 2nd gear change element, and a carrier C2 (C3) is used as the 3rd gear change element for the sun gear S3 of a minor diameter, and let the ring wheel R2 (R3) be the 4th gear change element. The moderation planetary gear G1 are considered as the simple planetary configuration which consists of three elements of the carrier C1 which supports a sun gear S1 and the pinion gear which gears to it, and the ring wheel R1 which gears to a pinion gear.
[0045] The 1st gear change element S3 of the planetary-gear set G, i.e., the sun gear of a minor diameter, is connected with the 1st clutch (C-1), and while the 2nd gear change element S2, i.e., the sun gear of a major diameter, is connected with the 3rd clutch (C-3), the stop of it in the automatic-transmission case 10 is enabled by the 1st brake (B-1) which consists of band brakes. Moreover, while the carrier C2 (C3) which is

the 3rd gear change element is connected with an input shaft 11 through the 2nd clutch (C-2) and the stop of it is enabled by the 2nd brake (B-2) at the change gear case 10, the one direction rotation stop of it in the change gear case 10 is enabled with the one-way clutch (F-1). And it is connected with the counter drive gear 19, the 4th gear change element R2 (R3), i.e., ring wheel. Moreover, the moderation planetary gear G1 are always considered as immobilization in the sun gear S1 at the change gear case 10, use a ring wheel R1 as an input element, are connected with an input shaft 11 and connected with the planetary-gear set G through the 1st clutch (C-1) and 3rd clutch (C-3) by using a carrier C1 as an output element.

[0046] The automatic transmission which consists of such a configuration changes gears based on a car load and the vehicle speed in the range of the gear ratio according to the range chosen by the operator by control by the electronic control and hydraulic control which are not illustrated. Drawing 3 diagrammatizes and shows the gear ratio attained by engagement and release (engagement is expressed with O mark and release is expressed with the-less mark) of each clutch and a brake. Moreover, drawing 4 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the velocity ratio of each gear change element at that time with a velocity diagram. In drawing, an axis of ordinate shows each element of the moderation planetary gear G1, and each gear change element of the planetary-gear set G, respectively, and the relation of gear ratio and a lengthwise direction location show [the longitudinal direction width of face between each / these / shaft] a velocity ratio. By considering the sun gear S1 of the moderation planetary gear G1 as immobilization (velocity ratio 0), and incidentally, giving an input (velocity ratio 1) to a ring wheel R1 Moderation rotation (velocity ratio of an intersection with the vertical line showing the straight line which connects the point of the velocity ratio 0 of a sun gear S1 and the point of the velocity ratio 1 of a ring wheel R1, and a carrier C1) is outputted to a carrier C1. This moderation rotation is made to input into the sun gear S3 of the planetary-gear set G by engagement of the 1st clutch (C-1). And when a carrier C2 (C3) is stopped by stop of the 2nd brake (B-2) (velocity ratio 0), moderation rotation of the 1st ** (1ST) is outputted to a ring wheel R3 (R2), and a sun gear S2 is raced by inverse rotation (velocity ratio -) to a sun gear S3 and a ring wheel R3 (R2).

[0047] The 1st ** (1ST) is engagement (in this gestalt, although it replaces with engagement of this brake (B-2) and automatic engagement of an one-way clutch (F-1) is used so that it may understand with reference to an actuation table) of a clutch (C-1) and a brake (B-2) so that both drawings may be combined and referred to and may be known. why the reason for using this engagement and this engagement are equivalent to engagement of a brake (B-2) is explained in full detail behind. It is attained. In this case, with reference to drawing 1 , reaction force is taken on the carriers C2 and C3 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of an one-way clutch (F-1), and moderation rotation of the maximum reduction gear ratio of a ring wheel R2 (R3) is outputted to the counter drive gear 19.

[0048] Next, the 2nd ** (2ND) is attained by engagement of a clutch (C-1) and a brake (B-1). In this case, reaction force is taken to the major-diameter sun gear S2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of a brake (B-1), and moderation rotation of a ring wheel R2 (R3) is outputted to the counter drive gear 19. The reduction gear ratio at this time becomes smaller than the 1st ** (1ST) so that it may see to drawing 4 .

[0049] Moreover, the 3rd ** (3RD) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into the major-diameter sun gear S2 and the minor diameter sun gear S3 via a clutch (C-1) and a clutch (C-3) at coincidence. Since the planetary-gear set G will be in a direct connection condition, rotation of the same ring wheel R2 (R3) as the input rotation to both sun gears is outputted to the counter drive gear 19 as rotation slowed down to rotation of an input shaft 11.

[0050] Furthermore, the 4th ** (4TH) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into a sun gear S3 via a clutch (C-1). The non-slowing down rotation inputted via the clutch clutch (C-2) from the input shaft 11 on the other hand is inputted into a carrier C3. Middle rotation of two input rotations is outputted to the counter drive gear 19 as rotation of the ring wheel R2 (R3) slightly slowed down to rotation of an input shaft 11.

[0051] Next, the 5th ** (5TH) is attained by coincidence engagement of a clutch (C-2) and a clutch (C-3). In this case, the rotation which the non-slowing down rotation as which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side was inputted into the sun gear S2 via the clutch (C-3), and was inputted via the clutch clutch (C-2) from the input shaft 11 on the other hand was

inputted into the carrier C2, and accelerated it more slightly than rotation of the input shaft 11 of a ring wheel R2 (R3) is outputted to the counter drive gear 19.
[0052] And the 6th ** (6TH) is attained by engagement of a clutch (C-2) and a brake (B-1). In this case, non-slowing down rotation is inputted only into a carrier C2 via a clutch clutch (C-2) from an input shaft 11, and the rotation whose sun gear S2 stopped by engagement of a brake (B-1) accelerated further the ring wheel R2 (R3) which takes reaction force is outputted to the counter drive gear 19.
[0053] In addition, go-astern (REV) is attained by engagement of a clutch (C-3) and a brake (B-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into a sun gear S2 via a clutch (C-3), and the inversion of the ring wheel R2 (R3) which takes reaction force on the carrier C2 stopped by engagement of a brake (B-2) is outputted to the counter drive gear 19.
[0054] Here, the relation of the one-way clutch (F-1) and brake (B-2) which touched previously is explained. both [these] brakes serve as the so-called friction element to which one release, simultaneously engagement of another side are carried out at the time of an up-and-down shift by both gear change interstage and which holds again and is carried out so that it may see in engagement / release relation of both the brakes at the time of the 1st above ** and the 2nd ** (B-1, B-2). A hold substitute of such a friction element will cause addition of the control valve for it, complication of a hydraulic circuit, etc., in order to need the precise concurrency control of the engagement pressure of the hydraulic servo which operates them, and solution pressure discharge and to perform such control. By then, the thing to consider as a setup which doubled the engagement direction of an one-way clutch (F-1) in the reaction force torque support direction at the time of the 1st ** by the 1st ** and the 2nd ** with this gestalt using the reaction force torque concerning a carrier C2 (C3) being reversed An one-way clutch (F-1) is made to demonstrate a function equivalent to engagement of a parenchyma top brake (B-2). It replaces with engagement of the brake at the time of the 1st ** (B-2) (however, since the direction of the reaction force torque which starts a carrier C2 (C3) in the state of the car coast of a wheel drive is reversed to the condition of an engine drive). in order to acquire the engine brake effectiveness, as O mark with a parenthesis shows to drawing 3 , engagement of a brake (B-2) is needed -- the carrier C2 (C3) is stopped -- it divides and comes out. Therefore, when attaining a gear ratio, the configuration which attains the 1st ** by engagement of a brake (B-2) can also be taken, without preparing an one-way clutch.
[0055] Thus, each gear ratio attained serves as a good rate step at equal intervals comparatively to each gear ratio so that it may understand qualitatively on the velocity diagram of drawing 4 with reference to spacing of the vertical direction of O mark which shows the velocity ratio of a ring wheel R2 (R3). If a numeric value is set up and this relation is expressed quantitatively concretely, it will become the gear ratio shown in drawing 3 . The gear ratio in this case Gear ratio lambda1=44/78 of the sun gear S1 of the moderation planetary gear G1, and a ring wheel R1, If it is set as gear ratio lambda3=30/78 of the sun gear S2 by the side of the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio lambda2=36/78 of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3 I/O gear ratio The 1st ** : (1ST) (1+lambda1) / the lambda3=4.067 2nd ** : (2ND) (1+lambda1) (lambda2+lambda3) / lambda 3 The =2.354 3rd ** (1+lambda2) : The 1+lambda1=1.564 4th ** (3RD) (4TH) :(1+lambda1)/ (1+lambda1-lambda1, lambda 3) =1.161 the 5**(5TH): (1+lambda1) -- /(1+lambda1+lambda1, lambda 2) =0.857 the 6**(6TH): -- 1/(1+lambda2) =0.684 go-astern (REV): -- it is set to -(1+lambda1)/lambda2=- 3.389. and the step between these gear ratio -- the -- the [1 and / between the 2nd speed / :1.73] -- the [2 and / between the 3rd speed / :1.51] -- the [3 and / between the 4th speed / :1.35] -- it is set to :1.25 between 4, and the :1.35 5-6th ** between the 5th speed.
[0056] It returns to drawing 1 and the 1st clutch (C-1) is arranged with this gear train at the moderation planetary gear G1, the 3rd clutch (C-3), and the other side at the one side of the planetary-gear set G according to the place by which it is characterized [of this invention], respectively. Thus, since the 1st clutch (C-1) and 3rd clutch (C-3) are distributed on both sides of the planetary-gear set G, the die length of the transfer member from the 1st clutch (C-1) and 3rd clutch (C-3) to the gear change elements S2 and S3 of the planetary-gear set G can be made into the shortest. Therefore, since lightweight-ization of a change gear can be performed since the member which transmits the high torque rotated with the planetary-gear set G is made short, and inertia can be made small, a gear change controllability improves.
[0057] Furthermore, the carrier C1 which is the output element of the moderation planetary gear G1 is connected with the 1st clutch (C-1) through the inner circumference of the planetary-gear set G. By doing in this way, the output element and the 1st clutch (C-1) of the moderation planetary gear G1 can be connected with a compact. Moreover, since a high torque-transmission member is not major-diameter-ized, while a centrifugal force becomes small and being able to carry out [part lightweight]-izing, since inertia can be

made small, a gear change controllability improves.
[0058] Furthermore, in this change gear, since it has the counter drive gear 19 which outputs the output of the planetary-gear set G to other shafts, the counter drive gear 19 is arranged between the planetary-gear set G and the 3rd clutch (C-3). Thus, by arranging, the planetary-gear set G can be adjoined and the 1st clutch (C-1) can be arranged. Such arrangement is useful to a change gear lightweight-izing the member which carries out high-speed rotation by that cause by making it the shortest in consideration of the 1st clutch (C-1) carrying out high-speed rotation compared with the 3rd clutch (C-3), and a gear change controllability's improves.
[0059] Next, drawing 5 shows the configuration of an automatic transmission in the typical cross section materialized further . Although the same reference mark is attached and being replaced with explanation about each component previously explained with reference to the skeleton, the relation between the details which cannot be referred to from a skeleton, each [mainly as opposed to an input shaft 11, the planetary-gear set G, and the moderation planetary gear G1] clutch, and a brake is explained here. In addition, through this specification, vocabulary called a clutch and a brake shall name generically the hydraulic servo which consists of the cylinder and piston by which endocyst is carried out to the drum as the friction material which consists of the disk and separator plate as an engaging-and-releasing member, and a power transfer member which supports friction material by spline engagement, and a hub and a drum, and a return spring, when they are the things of a multi-plate configuration. Moreover, the hydraulic servo which consists of the band, the cylinder and the piston, and return spring as an engaging-and-releasing member for a brake of a band configuration shall be named generically.
[0060] An input shaft 11 is used as the hollow shaft which had the feeding-and-discarding oilway of servo **, and lubricating oil way 11r formed in the interior. Before extending a front end and back end side from the change gear case 10, it is supported by side boss section 10a and backside boss section 10b free [rotation] through bearing. Shaft-orientations support is carried out by thrust bearing infixed between each flange 11a and 11b and both the boss section tips which were made to adjoin a supporter and were formed.
[0061] The hydraulic servos 7, 6, and 5 of the moderation planetary gear G1, the planetary-gear set G, and three clutches are arranged in shaft orientations, and are arranged at the periphery side in **** of an input shaft 11, respectively, the polymerization of the friction material 73, 63, 53, and 93 of each clutch and a brake is made to carry out in the direction of a path to them, and it is arranged at the periphery side. By this arrangement, compaction of the shaft-orientations dimension for a friction material arrangement tooth space is achieved. By arrangement by the side of a periphery by and the thing which the diameter of friction material of each clutch and a brake becomes large About the friction material 73 and 63 which carries out a polymerization to the moderation planetary-gear G1 and periphery side of the planetary-gear set G, only the part which can earn those torque capacity About the hydraulic servo 6 which reduces configuration number of sheets, and makes a shaft-orientations dimension small, and the friction material 53 makes carry out a polymerization to a periphery side, and is arranged Since the friction material 63 has been arranged at the periphery side and has earned torque capacity, a pressure receiving side can be made small, and minor diameter-ization of the friction material 53 which carries out a polymerization to those periphery side as a result also becomes possible by minor diameter-ization of the hydraulic servo by it. Therefore, according to this configuration, a shaft-orientations dimension can be shortened to the maximum extent, suppressing increase of the direction dimension of a path.
[0062] With this gestalt, front [in a change gear style], the planetary-gear set G is arranged at the moderation planetary gear G1 and the backside at a side. Furthermore, the hydraulic servo 7 of the 3rd clutch (C-3) The front of the moderation planetary gear G1 and the hydraulic servo 6 of the 1st clutch (C-1) The back of the planetary-gear set G and the hydraulic servo 5 of the 2nd clutch (C-2) It is arranged behind the hydraulic servo 6 of the 1st clutch (C-1). The friction material 63 of the 1st clutch (C-1) The friction material 73 of the 3rd clutch (C-3) is carried out at the periphery side of the moderation planetary gear G1, and polymerization arrangement of the friction material 53 of the 2nd clutch (C-2) is carried out at the periphery side of the hydraulic servo 6 of the 1st clutch (C-1) at the periphery side of the planetary-gear set G, respectively. The friction material 63 and 73 of the 1st and 3rd clutches which need large capacity in order to transmit the moderation rotation by which torque amplification was carried out by this arrangement By arranging to the periphery side of the planetary-gear set G with which constraint of the direction dimension of a path has been arranged in the comparatively loose shaft-orientations location, and the moderation planetary gear G1 Relatively in order to major-diameter-ize according to torque capacity and to transmit input rotation as it is torque capacity the friction material 53 of the 2nd clutch (C-2) which may be small By carrying out polymerization arrangement at the periphery side of the hydraulic servo 6 of the 1st

clutch (C-1) which was located behind the planetary-gear set G and was minor-diameter-ized with major-diameter-izing of the friction material 63 Since it becomes the arrangement no friction material is [arrangement] in the periphery side of the hydraulic servo 5 of the 2nd clutch (C-2), the outer diameter of a change gear style posterior part is conjointly minor-diameter-ized sharply with it being a minor diameter because small capacity is sufficient for the hydraulic servo 5 of the 2nd clutch (C-2). Therefore, according to this configuration, shortening a shaft-orientations dimension to the maximum extent, the outer diameter of the change gear back end section can be further made small, interference with the car flank material B can be avoided, and the car loading nature of the change gear made multistage is improving further.

[0063] Moreover, as this change gear was mentioned above with reference to the skeleton of drawing 1 The hydraulic servo 7 of the 3rd clutch (C-3) from the place which equips a change gear style with the differential-gear ring wheel 31 by which drive connection was carried out on the differential-gear shaft Z which is concurrent with an input shaft 11 It is arranged in the location which laps in the differential-gear ring wheel 31 and the direction of a path, and to the differential-gear ring wheel 31, the friction member 73 of the 3rd clutch (C-3) is shifted to shaft orientations, and is arranged. Although the periphery of the differential-gear ring wheel 31 has entered within the enclosure of a change gear, since it becomes the major diameter of a change gear style, and the arrangement in which it does not interfere by this configuration, a degree of freedom can be given to a setup of the wheel base of the input shaft 11 as a main shaft X of a change gear, and the differential-gear shaft Z which is concurrent with it, and a setup of the good differential-gear gear ratio doubled with the demand of a car is attained.

[0064] On the other hand, the moderation planetary gear G1 of the simple planetary configuration arranged around an input shaft 11 fix the sun gear S1 as a reaction force element to the tip periphery of before side boss section 10a, make the ring wheel R1 as an input element connect with flange 11a of an input shaft 11, and are arranged at the before [a change gear style] side. The carrier C1 as an output element is connected with the tubed part of the moderation rotation transfer member 13, and the tubed part constitutes the hub 74 of the 3rd clutch (C-3).

[0065] Next, positioning support of the planetary-gear set G is carried out with the gestalt supported by the periphery of the moderation rotation transfer member 13 of an input shaft 11 mostly supported by the input shaft 11 through bearing in both the sun gears S2 and S3 in pars intermedia through bearing. The sun gear S2 as 2nd gear change element of the planetary-gear set G is connected with the drum 72 of the 3rd clutch (C-3) by the connection member 14. Moreover, the sun gear S3 as 1st gear change element is connected with the hub 64 of the 1st clutch (C-1). And the carrier C2 (C3) as 3rd gear change element is connected with the drum 52 of the 2nd clutch, and the hub 94 of the 2nd brake (B-2) through the inner ball race of an one-way clutch (F-1). Furthermore, spline association of the ring wheel R2 (R3) as 4th gear change element is carried out through the connection member at the counter drive gear 19.

[0066] The hydraulic servo 7 of the 3rd clutch (C-3) has been arranged at the before [the moderation planetary gear G1] side, is equipped with the cylinder 70 supported by the periphery of before [a change gear case] side boss section 10a free [rotation], and the piston 71 by which endocyst was carried out to it, and constitutes the clutch drum 72 on which diameter expansion extension of the periphery side of a cylinder 70 was carried out. The feeding and discarding of the oil pressure of this hydraulic servo 7 are performed through oilway 10x in the case formed in before side boss section 10a. In addition, in drawing, a cancellation plate for a sign 75 to offset oil pressure or **** centrifugal oil pressure at the tooth back of a piston 71 and 76 show a return spring.

[0067] The friction material 73 of the 3rd clutch (C-3) makes a hub 74 carry out spline engagement of the inner circumference side. The back up plate which consisted of the friction material disks and separator plates of many plates which made the drum 72 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 72, The clutch engagement actuation pinched at the piston 71 extruded by supply of the oil pressure into a hydraulic servo 7 from a cylinder 70 considers as the configuration which transmits torque to a drum 72 from a hub 74.

[0068] The hydraulic servo 6 of the 1st clutch (C-1) has been arranged after the planetary-gear set G at the side, and is equipped with the cylinder 60 connected with the moderation rotation transfer member 13, and the piston 61 by which endocyst was carried out to it. Also in this case, the periphery side of a cylinder 60 constitutes the clutch drum 62 by which diameter expansion extension was carried out. Therefore, the clutch drum 62 of the 1st clutch (C-1) turns the opening side to the planetary-gear set G side, and is arranged. The feeding and discarding of the oil pressure of this hydraulic servo 6 are performed through oilway 11c formed in the input shaft 11. It has the return spring indicated to be the cancellation plate in which this hydraulic servo 6 is also shown with a sign 65 by 66.

[0069] The friction material 63 of the 1st clutch (C-1) makes a hub 64 carry out spline engagement of the inner circumference side. The back up plate which consisted of the friction material disks and separator plates of many plates which made the drum 62 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 62, The clutch engagement actuation pinched at the piston 61 extruded by supply of the oil pressure into a hydraulic servo 6 from a cylinder 60 considers as the configuration which transmits torque to a hub 64 from a drum 62.
[0070] The hydraulic servo 5 of the 2nd clutch (C-2) carries out fixed support of the inner circumference tubed part 50a of a cylinder 50 which connotes a piston 51 at flange 11b of an input shaft 11, makes tooth-back section 50b and periphery tubed part 50c counter back end wall 10c of the change gear case 10, and 10d of peripheral walls, and is arranged at the backside [the hydraulic servo 6 of the 1st clutch (C-1)], i.e., the backmost part of a change gear style. The feeding and discarding of the oil pressure of this hydraulic servo 6 are performed through oilway 10within case y formed in backside [a change gear case] boss section 10b. In this hydraulic servo, the clutch hub 54 is formed in the periphery side of the cancellation plate 55 which demarcates a cancellation room, and the configuration which supported the friction material 53 between the drums 52 connected with a hub 54 and a carrier is taken. Input rotation can be detected easily, without using the complicated means of arranging Sensor S in the interior of a change gear style, or detecting indirectly by this configuration, using a special detection means, since the sensor S formed in the change gear case 10 from rotation of the cylinder 50 of the hydraulic servo 5 of the 2nd clutch (C-2) can perform detection of input rotation required for control of a change gear directly.
[0071] The friction member 53 of the 2nd clutch (C-2) The back up plate which consisted of the friction material disks and separator plates of many plates which made the hub 54 carry out spline engagement of the inner circumference side, and made the drum 52 carry out spline engagement of the periphery side, and was fixed at the tip of a hub 54, The clutch engagement actuation pinched at the piston 51 extruded by supply of the oil pressure into a hydraulic servo 5 from a cylinder 50 considers as the configuration which transmits torque to a drum 52 from a hub 54.
[0072] The 1st brake (B-1) is used as a band brake, and the brake band 8 is arranged at the periphery of the drum 72 of the 3rd clutch (C-3), and is considered as the configuration which uses a drum 72 as a brake drum. By this, the 1st brake (B-1) will not require a shaft-orientations tooth space, but will be arranged, without moreover making most direction dimensions of a path increase. In addition, the hydraulic servo of this band brake is the same shaft-orientations location as a brake band 8, and since it is what is prolonged in a tangential direction to a drum 73, it is omitting illustration.
[0073] The 2nd brake (B-2) is considered as a multi-plate configuration like each clutch, and the friction material 93 compares with an one-way clutch (F-1), and is arranged at the periphery side of the planetary set G. The hydraulic servo 9 of the 2nd brake (B-2) is formed with the gestalt which made the cylinder which connotes a piston 91 build in support 10e of the change gear case 10 mostly prepared in the center.
[0074] And about support of the counter drive gear 19, this gear 19 is supported by the inner circumference of the above-mentioned support 10e through bearing 12, and the periphery of the boss section prolonged in shaft orientations in the inner circumference of the counter drive gear 19 is supported by the inner circumference of support 10e of the change gear case 10 which serves as the oil pressure servo cylinder of the 2nd brake (B-2) through bearing 12 in detail.
[0075] The moderation planetary gear G1 and the planetary-gear set G which make indispensable the thing in **** arranged as much as possible in a bore side with this operation gestalt in this way for absolute miniaturization of that change gear style Connecting an oilway through the relative rotation section of a minor diameter as much as possible the hydraulic servos 7, 6, and 5 of each clutch desirable in respect of mitigation of the ease of hydraulic pressure supply, and the sliding friction of a seal ring and to the bore side of **** Arrange and arrange to shaft orientations with the can UNTA drive gear 19, and polymerization arrangement of the friction material 73, 63, and 53 of a more advantageous [each / consider / as a major diameter] clutch is carried out from the balance of an effective diameter and friction material number of sheets at an outer-diameter side. Then, by the configuration which has arranged rationally both brakes (B-1, B-2) and an one-way clutch (F-1) to the middle tooth space obtained, effectiveness is acquired for compaction of the maximum shaft-orientations dimension.
[0076] By the way, although the moderation planetary gear G1 were considered as the simple planetary-gear configuration with the above-mentioned 1st operation gestalt with emphasis on mainly making good the gear ratio and the gear ratio step as a change gear style, when putting emphasis on simplifying connection relation with the planetary-gear set G, it is also effective to consider the moderation planetary gear G1 as a double pinion configuration. The cross section [-izing / the change gear style of the 2nd operation gestalt

carried out in this way / the cross section / the ** type] shows drawing 6 . If only the difference in this case is explained, the carrier C1 used as the output element in the 1st operation gestalt is connected with an input shaft 11 as an input element, and the ring wheel R1 used as the input element is connected with the moderation rotation transfer member 13 as an output element. If such connection relation is taken, since it will become the gestalt which leads an output to the backside from a periphery to the input from the backside [the moderation planetary gear G1], only the part it becomes unnecessary to turn the moderation rotation transfer member 13 to a before [the moderation planetary gear G1] side can be shortened.
[0077] With modification connection-related [such], the hydraulic servo 7 of the 3rd clutch (C-3) connects the cylinder 70 with the carrier C1 of the moderation planetary gear G1 by the inner circumference side, and the drum 72 is considered as the configuration cut off from a hydraulic servo 7. Therefore, although clutch engagement actuation is made by pinching of the friction material 73 between the back up plate of a hub 74, and a piston 71 in this case and thrust loading will be applied to the moderation rotation transfer member 13 This load is transmitted to flange 11b on the backside [an input shaft 11] through thrust bearing from the back end of the moderation rotation transfer member 13. It becomes the closed loop which returns to the cylinder 70 of the hydraulic servo 7 fixed to flange 11a by the side of before through the carrier C1 through an input shaft 11, and it is balanced, without carrying out a load to the change gear case 10.
[0078] Next, drawing 7 shows the 3rd operation gestalt which shortened the axial length of a change gear as a whole by the type section. In this gestalt, the hydraulic servo 9 of the 2nd brake (B-2) is formed with the gestalt which posterior-wall-of-stomach 10c of a change gear case was made to build in the periphery side of the hydraulic servo 5 of the 2nd clutch (C-2). In connection with this, the friction material 93 of a brake (B-2) and the location of an one-way clutch (F-1) are considered as reverse arrangement to the 1st operation gestalt, and the press section of the piston 91 of a hydraulic servo 9 is extended through the periphery of the 1st clutch (C-1) toward the friction material 93 left in location.
[0079] Moreover, the configuration to which the counter drive gear 19 supports the inner circumference side of support wall 10e directly through bearing by modification of the above-mentioned hydraulic-servo location according to the periphery side space on the backside [support wall 10e] becoming free on the periphery of the boss section prolonged back is taken. Thereby, the connection structure of a ring wheel R2 and the counter drive gear 19 is simplified extremely, and compaction of much more change gear axial length is realized. About other configurations, it is substantially [as the 1st operation gestalt] the same.
[0080] Next, drawing 8 shows the 4th operation gestalt which reversed arrangement of the hydraulic servo 7 of the moderation planetary gear G1 and the 3rd clutch (C-3) to the 1st operation gestalt by the type section. With this gestalt, the hydraulic servo 7 of the 3rd clutch (C-3) is considered as support on an input shaft. In connection with this, 11d of oilways within a shaft which make oilway 10x and a hydraulic servo 7 open for free passage in a case is formed in the input shaft 11. Moreover, the brake drum of the 1st brake (B-1) which the output of the moderation planetary gear G1 was connected with the clutch drum 72, and the clutch hub 74 was connected with the connection member 14, and was connected with them is constituted as a drum of dedication which covers the periphery of the clutch drum 72.
[0081] Moreover, with this 4th operation gestalt, the configuration which attaches separately the oil pressure servo cylinder 90 of the 2nd brake (B-2) in the peripheral wall of the change gear case 10 is taken, and the configuration which supports the inner circumference side of support wall 10e directly through bearing like the 3rd operation gestalt on the periphery of the boss section prolonged back is taken about support of the counter drive gear 19. About other configurations, it is substantially [as the 1st operation gestalt] the same.
[0082] Next, drawing 9 shows the 5th operation gestalt which considered all the components as order (it influences on drawing) reverse arrangement to the 1st operation gestalt by the type section.
[0083] In addition, with this 5th operation gestalt, about the configuration of an one-way clutch (F-1), it takes with the same support configuration as the 3rd operation gestalt in support of the counter drive gear 19, and the 2nd brake (B-2) list, and the configuration which supports the inner circumference side of support wall 10e directly through bearing on the periphery of the boss section prolonged ahead is taken.
[0084] Next, drawing 10 shows the 6th operation gestalt which considered all the components as order (it influences on drawing) reverse arrangement to the 4th operation gestalt by the type section. By contrast with drawing 8 which shows the 4th operation gestalt, naturally, since the array of each element in this case is clear, it omits explanation.
[0085] Although the six above-mentioned operation gestalten apply this invention to a horizontal-type change gear, this invention is also applicable to the vertical-type change gear for front engine Riyadh live (FR) vehicles. Drawing 11 shows the 7th operation gestalt which takes such a gestalt by the skeleton, and shows the relation between each engagement element in that case, the gear ratio attained, gear ratio, and a

gear ratio step to drawing 12 , and shows a velocity diagram to drawing 13 . Essentially, the change gear style in this gestalt also has two differences accompanying having made said each gestalt vertical, although it was the same. Since constraint of axial length is loose compared with the case of a horizontal type, the 1st [the] is a gear change transient especially the one-way clutch which has the same semantics as the juxtaposition of an one-way clutch (F-1) to the 2nd brake (B-2) in a precedence implementation gestalt that it should hold and the oil pressure control at the time of substitute gear change should be simplified, and the point of having established the combination of a brake also to the 1st brake (B-1). And the 2nd is a point which has connected the ring wheel R2 as an output element with output-shaft 19A of an input shaft 11 and the same axle.

[0086] Since the name of the 2nd brake and an one-way clutch has shifted to each precedence gestalt with addition of such a component, redundancy is the semantics which avoids derangement although it becomes, and it explains anew from a gear train configuration.

[0087] With reference to drawing 11 , the configuration by which the torque converter 4 with a lock-up clutch connected with the engine which is not illustrated at the foremost part of that device has been arranged, and the change gear style which attains advance 6 ** and the go-astern 1st speed at that posterior part has been arranged is taken with this automatic transmission.

[0088] The planetary-gear set G which forms the subject of a change gear style The sun gears S2 and S3 of a pair with which the diameters of size differ like each previous operation gestalt, While gearing mutually and one side's gearing to the sun gear S2 of a major diameter, it gears to a ring wheel R2 (R3), and it consists of RABINIYO-type gear sets by which another side consists of a carrier C2 (C3) which supports the pinion gears P2 and P3 of a pair which gear to the sun gear S3 of a minor diameter. and the 1st gear change element S3 of the planetary-gear set G, i.e., the sun gear of a minor diameter It connects with the 1st clutch (C-1). The 2nd gear change element S2, i.e., the sun gear of a major diameter While connecting with the 3rd clutch (C-3), a stop in the automatic-transmission case 10 is enabled by the 1st brake (B-1) which consists of band brakes. Furthermore, the stop in the automatic-transmission case 10 is enabled by this, the one-way clutch (F-1) arranged in parallel, and the brake (B-2). Moreover, while the carrier C2 (C3) which is the 3rd gear change element is connected with an input shaft 11 through the 2nd clutch (C-2) and the stop of it is enabled by the 2nd brake (B-3) at the change gear case 10, the one direction rotation stop of it in the change gear case 10 is enabled with the one-way clutch (F-2). And it is connected with output-shaft 19A, the 4th gear change element R2 (R3), i.e., ring wheel.

[0089] Moreover, it is similarly constituted from simple planetary gear by the moderation planetary gear G1. While the ring wheel R1 as the input element is connected with an input shaft 11 and the carrier C1 as an output element is connected with the minor diameter sun gear S3 through the 1st clutch (C-1) It connects with the sun gear S2 of a major diameter through the 3rd clutch (C-3), and the sun gear S1 as a fixed element which takes reaction force is fixed to the change gear case 10.

[0090] The relation between engagement and release of each clutch in the case of this automatic transmission, a brake, and an one-way clutch, and the gear ratio attained comes to be shown in the engagement graph of drawing 12 . In O mark in an engagement table, engagement and the-less mark express the engagement to which release and ** mark do not carry out the direct action of the engagement only at the time of engine brake, and the - mark to achievement of a gear ratio. Moreover, drawing 13 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the rotational frequency ratio of each gear change element at that time with a velocity diagram.

[0091] The 1st ** (1st) is engagement (in this gestalt, although it replaces with engagement of this brake (B-3) and automatic engagement of an one-way clutch (F-2) is used so that it may understand with reference to an actuation table) of a clutch (C-1) and a brake (B-3) so that both drawings may be combined and referred to and may be known. it is as being only those names and having explained why the reason for using this engagement and this engagement are equivalent to engagement of a brake (B-3) in the previous operation gestalt with the relation between a brake (B-2) and an one-way clutch (F-1). It is attained. In this case, reaction force is taken on the carrier C2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 by the C-clutch 1 course, and was stopped by engagement of an one-way clutch F-2, and moderation rotation of the maximum reduction gear ratio of a ring wheel R2 (R3) is outputted to output-shaft 19A.

[0092] Next, the 2nd ** (2nd) is attained by engagement (why these engagement is equivalent to engagement of a brake (B-1) is explained in full detail behind.) of the brake (B-2) which confirms engagement and it of a clutch (C-1) and the one-way clutch (F-1) equivalent to engagement of a brake (B-1).

In this case, reaction force is taken to the major-diameter sun gear S2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of a brake (B-2) and an one-way clutch (F-1), and moderation rotation of a ring wheel R2 (R3) is outputted to output-shaft 19A. The reduction gear ratio at this time becomes smaller than the 1st ** (1st) so that it may see to drawing 13 .

[0093] Moreover, the 3rd ** (3rd) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into the major-diameter sun gear S2 and the minor diameter sun gear S3 via a clutch (C-1) and a clutch (C-3) at coincidence. Since the planetary-gear set G will be in a direct connection condition, rotation of the same ring wheel R2 (R3) as the input rotation to both sun gears is outputted to output-shaft 19A as rotation slowed down to rotation of an input shaft 11.

[0094] Furthermore, the 4th ** (4th) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into a sun gear S3 via a clutch (C-1). The non-slowing down rotation inputted via the clutch (C-2) from the input shaft 11 on the other hand is inputted into a carrier C3, and middle rotation of two input rotations is outputted to output-shaft 19A as rotation of the ring wheel R2 (R3) slightly slowed down to rotation of an input shaft 11.

[0095] Next, the 5th ** (5th) is attained by coincidence engagement of a clutch (C-2) and a clutch (C-3). In this case, the rotation which the non-slowing down rotation as which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side was inputted into the sun gear S2 via the clutch (C-3), and was inputted via the clutch (C-2) from the input shaft 11 on the other hand was inputted into the carrier C2, and accelerated it more slightly than rotation of the input shaft 11 of a ring wheel R2 (R3) is outputted to output-shaft 19A.

[0096] And the 6th ** (6th) is attained by engagement of a clutch (C-2) and a brake (B-1). In this case, non-slowing down rotation is inputted only into a carrier C2 via CHIKURATCHI (C-2) from an input shaft 11, reaction force is taken to the sun gear S2 stopped by engagement of a brake (B-1), and the rotation which accelerated the ring wheel R2 (R3) further is outputted to output-shaft 19A.

[0097] In addition, go-astern (R) is attained by engagement of a clutch (C-3) and a brake (B-3). In this case, reaction force is taken on the carrier C2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the sun gear S2 via the clutch (C-3), and was stopped by engagement of a brake (B-3), and the inversion of a ring wheel R2 (R3) is outputted to output-shaft 19A.

[0098] Here, the relation of the one-way clutch (F-1) and both the brakes (B-1, B-2) which touched previously is explained. In this case, an one-way clutch (F-1) can be made to demonstrate a function equivalent to engagement of a parenchyma top brake (B-1) by considering as a setup which doubled the engagement direction of the one-way clutch (F-1) connected with the sun gear S2 in the reaction force torque support direction at the time of the 2nd ** of a sun gear S2. However, since unlike a carrier C2 (C3) this sun gear S2 is not only engaged in order to acquire the engine brake effectiveness at the time of the 2nd **, but is a gear change element stopped also for the 6th ******, a brake (B-1) is needed. Moreover, although a sun gear S2 rotates to hard flow to an input hand of cut at the time of the 1st ** (1st) achievement so that it may understand also with the velocity diagram of drawing 13 , in the case of the gear ratio of the 3rd more than **, it rotates in the same direction as an input hand of cut. Therefore, since an one-way clutch (F-1) cannot be connected with a direct holddown member, it is considering effectiveness of an engagement condition as the controllable configuration by serial arrangement with a brake (B-2).

[0099] Thus, each gear ratio attained serves as a good rate step at equal intervals comparatively to each gear ratio so that it may understand qualitatively on the velocity diagram of drawing 13 with reference to spacing of the vertical direction of O mark which shows the velocity ratio of a ring wheel R2 (R3). If a numeric value is set up and this relation is expressed quantitatively concretely, it will become a step between the gear ratio shown in drawing 12 . The gear ratio in this case is the case where it is set as gear ratio lambda3=0.375 of the sun gear S1 of the moderation planetary gear G1, the sun gear S2 by the side of gear ratio lambda1=0.556 of a ring wheel R1, and the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio lambda2=0.458 of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3, and gear ratio width of face is set to 6.049.

[0100] Next, drawing 14 shows the configuration of an automatic transmission further to a detail in a cross section. Although the same reference mark is attached and being replaced with explanation about each component previously explained with reference to the skeleton, the details which cannot be referred to from

a skeleton are explained below. First, an input shaft 11 supports a front end side through bearing with this gestalt to boss section 10a of a change gear case, and the configuration supported to backside [a change gear case] boss section 10b through output-shaft 19A of the same axle is taken by the back end side. Therefore, after having been minor-diameter-ized, carrying out fitting to the axial hole of output-shaft 19A, carrying out bearing support and carrying out the total material of the back end section of an input shaft 11 from back end wall 10c of the change gear case 10 through output-shaft 19A, it is supported by side boss section 10b free [rotation].

[0101] Output-shaft 19A is supported by backside [the change gear case 10] boss section 10b free [rotation] through a roller bearing in the front end section, and extension housing 10A fixed to the backmost part of the change gear case 10 supports the back end section free [rotation] through ball BEARIGU. And the connection section to the ring wheel R2 (R3) as an output element of the planetary-gear set G is used as the flange of the output-shaft front end, and is connected with the ring wheel R3 through the drum-like member.

[0102] In this change gear, the hydraulic servo 9 which constitutes the 2nd brake (B-3) since the configuration which does not prepare a support in the pars intermedia of the change gear case 10 is taken is considered as the arrangement built in there by using as a cylinder the annular tooth space surrounded by the peripheral wall on the backside [the change gear case 10], back end wall 10c, and backside boss section 10b. Since it becomes a distant location by this hydraulic-servo arrangement to the friction material 93 arranged at the before [a periphery] side of the planetary-gear set G, the piston 91 of a hydraulic servo 9 is prolonged [section / that / press] in the periphery of the ring wheel R2 (R3) of a planetary-gear set in the 1st and 2nd clutch (C-1, C-2) lists, and total material is carried out so that the edge of the friction material 93 may be arrived at.

[0103] In connection with the connection section to output-shaft 19A of the ring wheel R2 (R3) of the above-mentioned planetary-gear set G, and the arrangement in which the hydraulic servo 9 of the 2nd brake (B-3) is built by the annular tooth space on the backside [the change gear case 10] Since the hydraulic servo 5 of the 2nd clutch (C-2) cannot be arranged on backside boss section 10b, the configuration which supports a hydraulic servo 5 directly on the periphery of the back end section of an input shaft 11 with this gestalt is taken. And in connection with this configuration change, for the hydraulic pressure supply to a hydraulic servo 5, oilway 11within shaft e for servo ** is formed in the posterior part of an input shaft 11, and oilway 10y of the boss section is opened for free passage by this oilway 11e through the oilway which crosses output-shaft 19A.

[0104] About the one-way clutch (F-1) and brake (B-2) which are added in this gestalt, that inner ball race is fixed to the cylinder 70 of the 3rd clutch (C-3), and an one-way clutch (F-1) is considered as the configuration united with the hub of a brake (B-2) in an outer race, and is arranged in the front of the 3rd clutch (C-3), i.e., the foremost part of a change gear style. Let the brake (B-2) which stops an outer race in the change gear case 10 be the brake of the multi-plate configuration which makes friction material the separator plate by which engagement support was carried out at the outer race at the friction material by which engagement support was carried out, and the inner circumference spline of the change gear case 10. The hydraulic servo of a brake (B-2) uses the front end wall of the change gear case 10 as a cylinder, and is considered as the configuration equipped with the piston fitted in it free [sliding], and the return spring which a shaft-orientations stop is carried out to the front end wall of the change gear case 10, and contacts a piston.

[0105] Since the part which serves as original dead space by the side of a planetary-gear set G periphery since the friction member 93 of the 2nd brake (B-3) is arranged at the periphery side lacking in the ring wheel of the planetary-gear set G according to such a configuration or the becoming 7th operation gestalt is utilizable effective in arrangement of the friction member 93 of a brake, it can use for compaction of the shaft orientations of a change gear, and the direction of a path.

[0106] Furthermore, since the friction material 93 is made into the friction material of many plates and the hydraulic servo 9 is arranged at the backmost part of a change gear, the 2nd brake (B-3) can use the back end wall of the automatic-transmission case 10 as an oil pressure servo cylinder, and ******ing of it to the change gear case exterior like [in case a hydraulic servo is a band brake] is lost, and it does not make the tooth space of a vehicle room small. Moreover, in the case of a band brake, the force to a certain direction is applied by the engagement to the carrier with which a band brake is arranged, and this has a bad influence on centering and support of a planetary-gear set or support of the input shaft with which the planetary-gear set is supported, or centering. Therefore, it is necessary to enlarge the bush, the bearing, or the input shaft itself for supporting an input shaft and a planetary-gear set. However, in this operation gestalt, since the 2nd

brake (B-3) is a multiple disc brake, it does not have the following and can be used as a compact automatic transmission.

[0107] Also in application to the change gear of such a vertical configuration, various modification is possible like the case of a horizontal type. Such an example of modification is given to below. First, drawing 15 shows the 8th operation gestalt which reversed the location of the 3rd clutch (C-3) and the moderation planetary gear G1 by the type section. In this case, supply of the oil pressure to the hydraulic servo 7 of the 3rd clutch (C-3), and the interrelations of the moderation planetary gear G1, those support relation, connection relation with the planetary-gear set G and the 3rd clutch is the same as that of the case of the 4th operation gestalt shown in drawing 8 .

[0108] Next, drawing 16 shows the 9th operation gestalt which supported the hydraulic servo 7 of the 3rd clutch (C-3) to support 10f, considering as the same arrangement as the above-mentioned 8th operation gestalt. With this gestalt, the hydraulic servo 7 of the 3rd clutch is supported by the periphery of the boss section prolonged ahead through bearing from support 10f, and the hydraulic servo 7 is changed into positive arrangement in connection with it. And the front end of the drum 72 formed successively at the periphery side of the cylinder 70 of a hydraulic servo 7 was extended, and is connected with the inner ball race of the one-way clutch (F-1) which has not been repositioned. From this connection relation, since the periphery side of the moderation planetary gear G1 is closed by the clutch drum 72, the carrier C1 of the moderation planetary gear G1 is connected with the clutch hub 74 side.

[0109] When taking such arrangement, the increment in the change gear axial length of the part is not avoided by arrangement of support 10f, but it is support to support 10f of a hydraulic servo 7, and since supply of oil pressure is attained from oilway 10in support u at a hydraulic servo 7, without minding an input shaft 11, it is in the point that the oilway arrangement within before side boss section 10a and an input shaft is simplified. Especially this arrangement is effective at the point which can be useful to reducing the oilways of side boss section 10a before being constituted as ****** of the body of an oil pump with which an oilway usually becomes complicated, and can raise the degree of freedom of the oilway configuration of an oil pump body.

[0110] Next, drawing 17 shows the 10th operation gestalt which transferred the 2nd clutch (C-2) between the moderation planetary gear G1 and the 3rd clutch (C-3), considering as the same arrangement as the above-mentioned 9th operation gestalt. Since it becomes the power transfer inserted as the 2nd clutch (C-2) was an input shaft 11, differing on each operation gestalt which is preceded in the case of this gestalt, and an essential target is the point that an input shaft 11 is divided into two. An input shaft 11 is divided forward and backward in the arrangement location of the hydraulic servo 5 of the 2nd clutch (C-2), and, specifically, is considered as the configuration which is made to carry out fitting of the after flank part 11B to before [an input shaft] flank part 11A, and carries out bearing support. And the hydraulic servo 5 of the 2nd clutch (C-2) is constituted considering the periphery and connection member of before [an input shaft] flank part 11A as a cylinder just behind flange 11a which connects an input shaft 11 with the ring wheel R1 of the moderation planetary gear G1. The friction material 53 arranged on the periphery of the own hydraulic servo 5 fixes to the front end of after [an input shaft] flank part 11B the hub 54 which supports to the drum 52 which fixed the periphery to the connection member, and supports inner circumference, and is arranged.

[0111] the advantage by such the 10th operation gestalt be in the mass of the member which be that after [an input shaft] flank part 11 B will be in a idle state at the low-speed stage [need] side of the 1st - the 3rd ** , take the power transfer by engagement of the 2nd clutch (C - 2) by input rotation , and turn around it , and the point which can make the inertial force small with reference to the engagement graph of drawing 12 so that clearly .

[0112] Finally, drawing 18 shows the 11th operation gestalt which carried out contiguity arrangement of the 1st and 3rd clutches as much as possible at the planetary-gear set. With this gestalt, the moderation planetary gear G1 and the 2nd clutch (C-2) are arranged at the foremost part of a change gear style. The hydraulic servo 5 is also arranged in support of the 2nd clutch (C-2) to before side boss section 10a, and, specifically, it considers as the configuration which supported the moderation planetary gear G1 on the periphery of the boss section ahead prolonged from support 10f. And the hydraulic servo 5 of the 2nd clutch (C-2) is connected with flange 11a of an input shaft 11, and the opening side tip side of the clutch drum 53 is connected with the ring wheel R1 of the moderation planetary gear G1. The friction material 53 of the 2nd clutch (C-2) is arranged in the almost middle shaft-orientations location of a hydraulic servo 5 and the moderation planetary gear G1, and the clutch hub 54 is connected with the front end of after [an input shaft] flank part 11B through between a hydraulic servo 5 and the moderation planetary gear G1.

[0113] The 3rd hydraulic servo 7 and one-way clutch (F-1) of a clutch (C-3) are supported by the periphery

of the boss section prolonged back in the support 10f inner circumference side. Moreover, the hydraulic servo of a brake (B-2) is built in the annular tooth space by the side of a support 10f periphery. And the carrier C1 as an output element of the moderation planetary gear G1 is connected with the clutch hub 74 of the 3rd clutch (C-3) through support 10f inner circumference, and this hub 74 is connected with the hydraulic servo 6 of the 1st clutch (C-1) through the moderation rotation transfer member 13.

[0114] The advantage by such 11th operation gestalt is making the 1st and 3rd clutches adjoin the planetary-gear set G as much as possible, and arranging them as mentioned above. In addition to the point which can constitute the high torque-transmission path of a clutch output side in the shortest, the hydraulic-pressure-supply way to three clutches is distributed with sufficient balance, and it is in the point that hydraulic pressure supply to each hydraulic servo and supply of a lubricating oil can be performed, without preparing two or more oilways within a shaft arranged in parallel in an input shaft 11.

[0115] as mentioned above, although the operation gestalt which changed connection relation into the format and arrangement list of a component for this invention was mentioned and explained in full detail, these are instantiation of the example of representation, and this invention is not limited to these operation gestalt, it can be variously looked like [each claim of a claim] within the limits of the matter of a publication, and can change and carry out a concrete configuration.

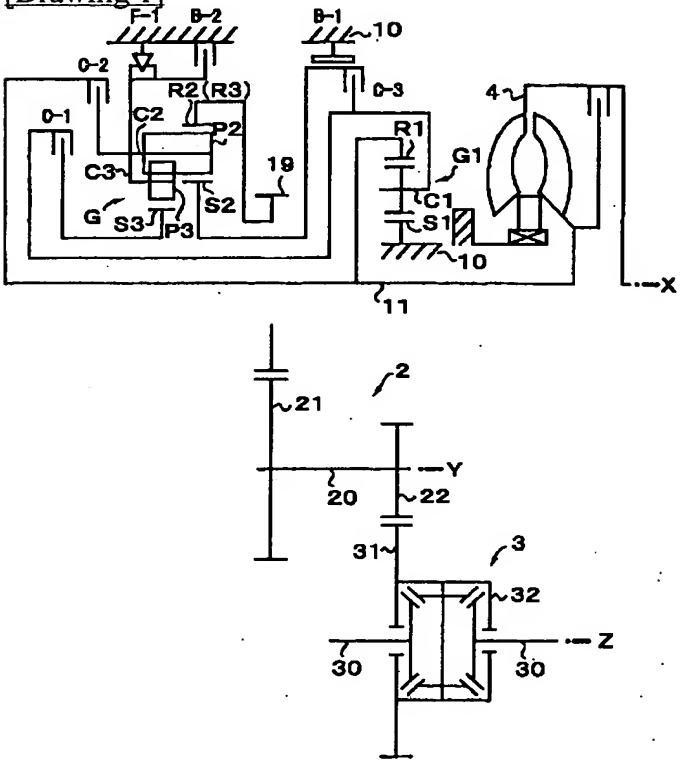
[Translation done.]

* NOTICES *

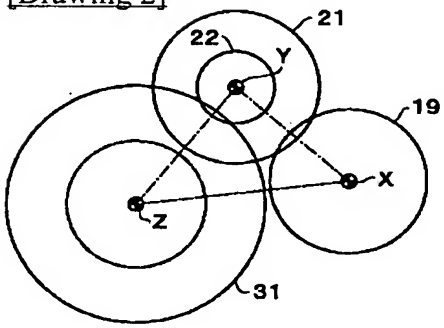
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



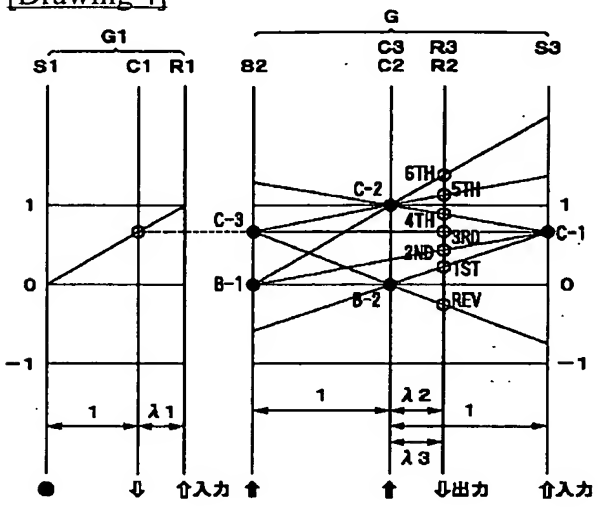
[Drawing 2]



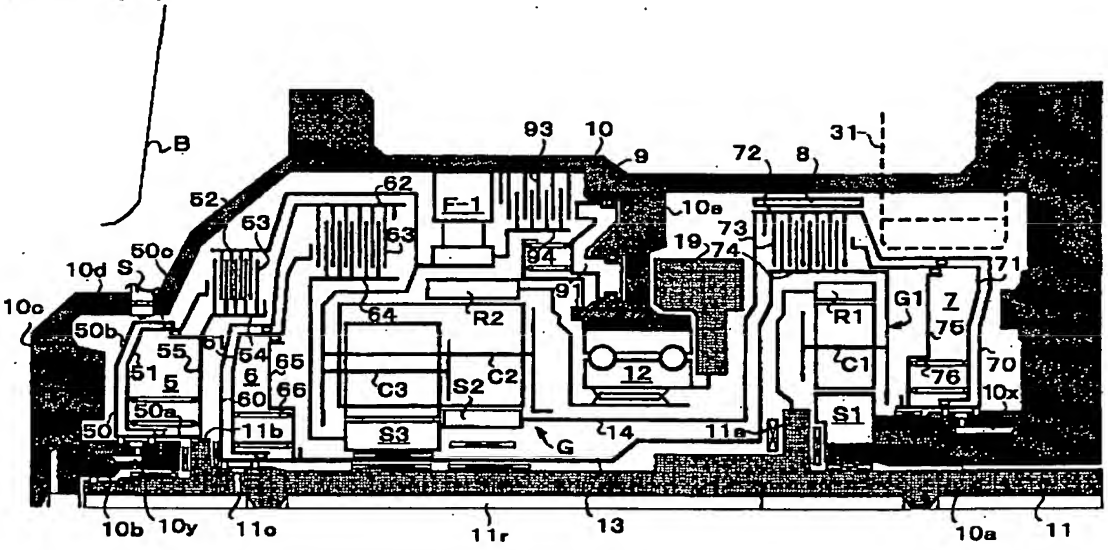
[Drawing 3]

	C-1	C-2	C-3	B-1	B-2	F-1	ギヤ比	ステップ
P								
REV			O		O		3.389	
N								
1ST	O				(O)	O	4.067	)1.73
2ND	O			O			2.354	)1.51
3RD	O		O				1.564	)1.35
4TH	O	O					1.161	)1.35
5TH		O	O				0.857	)1.25
6TH		O		O			0.648	

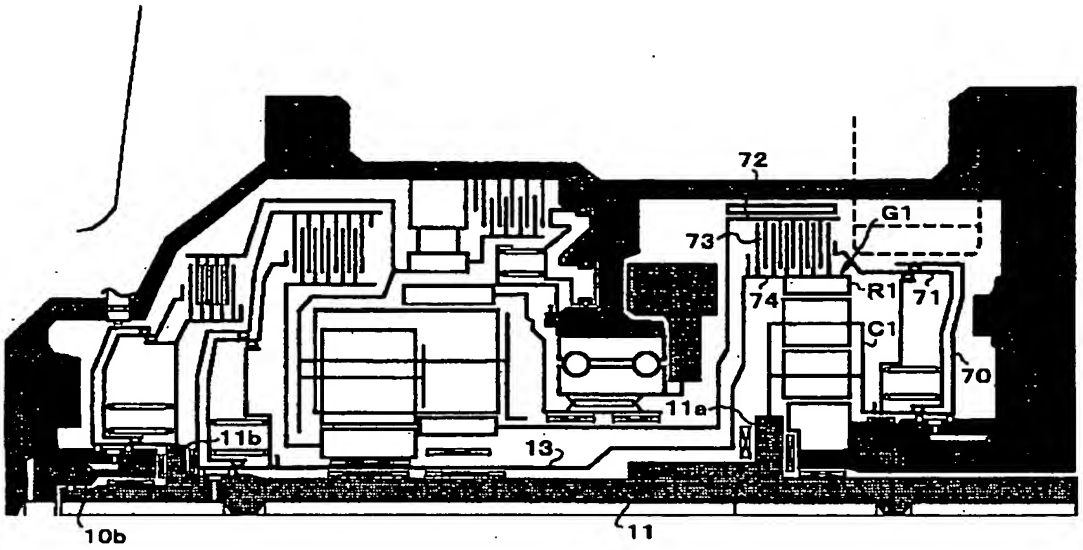
[Drawing 4]



[Drawing 5]



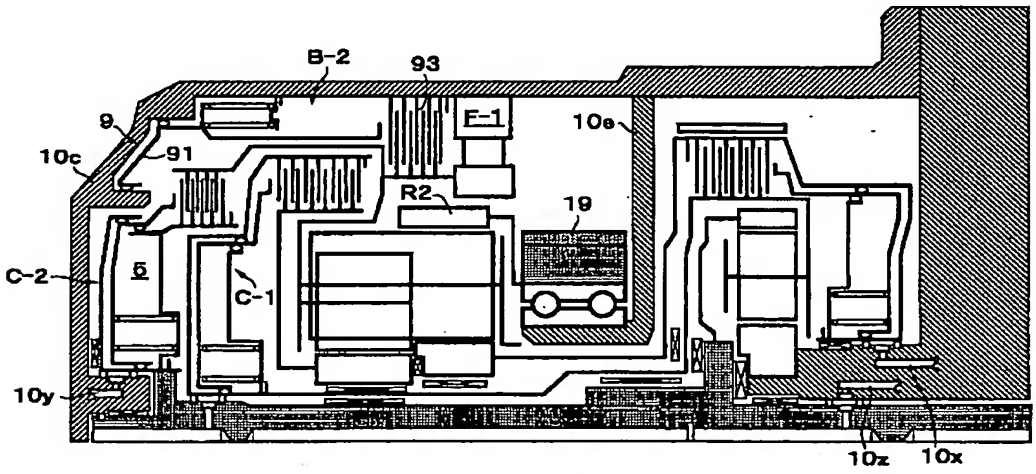
[Drawing 6]



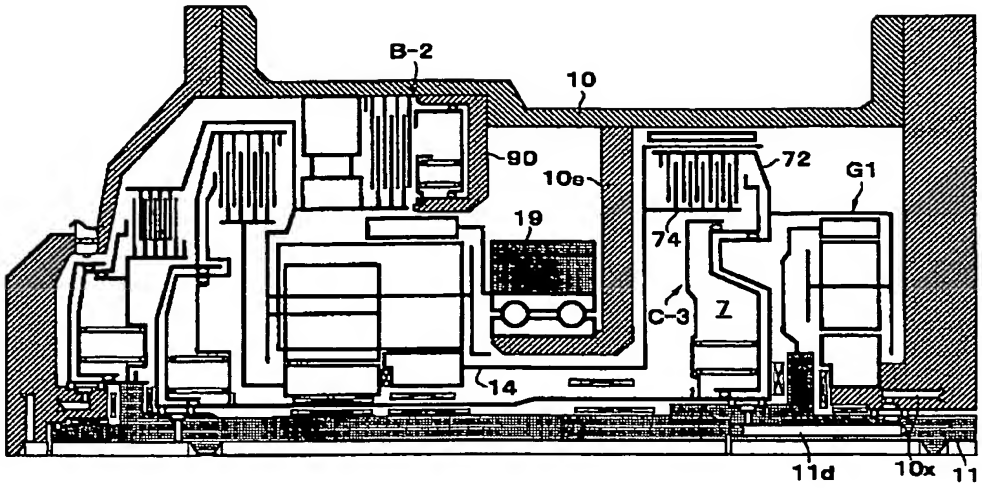
[Drawing 12]

	C-1	C-2	C-3	B-1	B-2	B-3	F-1	F-2	ギヤ比	ステップ
P										
R			○			○			3.394	
N										
1st	○					△		○	4.148	1.75
2nd	○			△	○		○		2.370	1.52
3rd	○		○		●				1.556	1.35
4th	○	○			●				1.155	1.34
5th		○	○		●				0.859	1.25
6th		○		○	●				0.688	

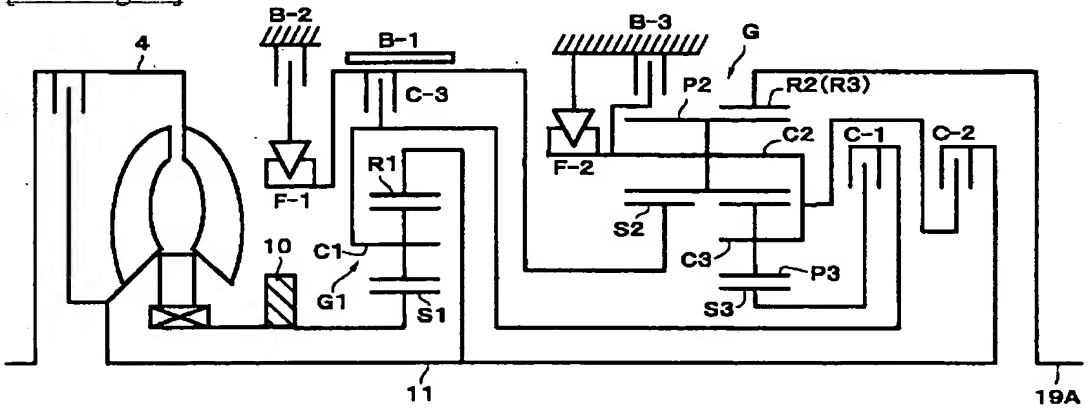
[Drawing 7]



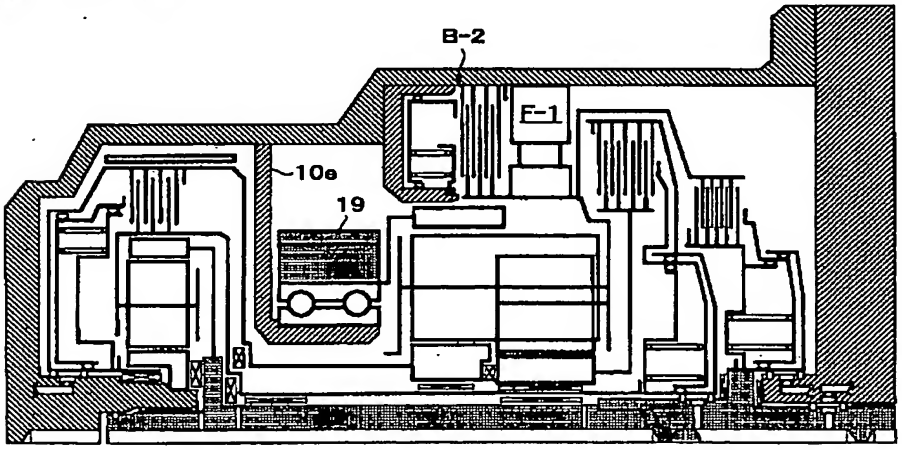
[Drawing 8]



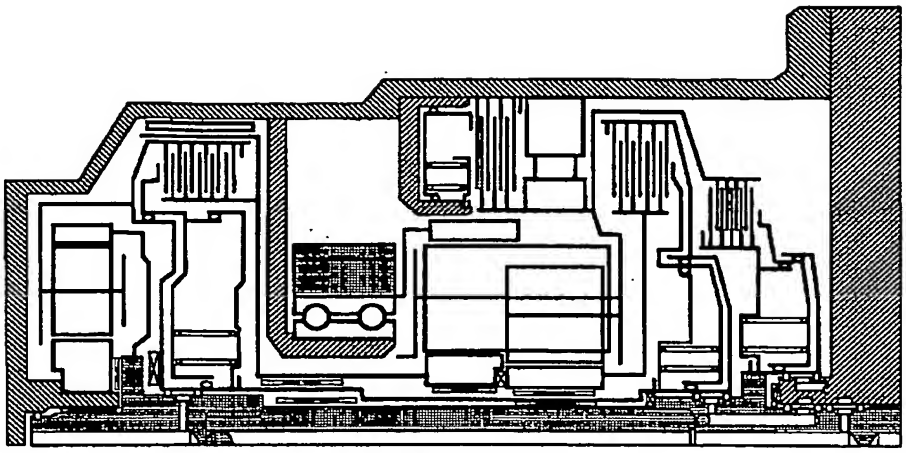
[Drawing 11]



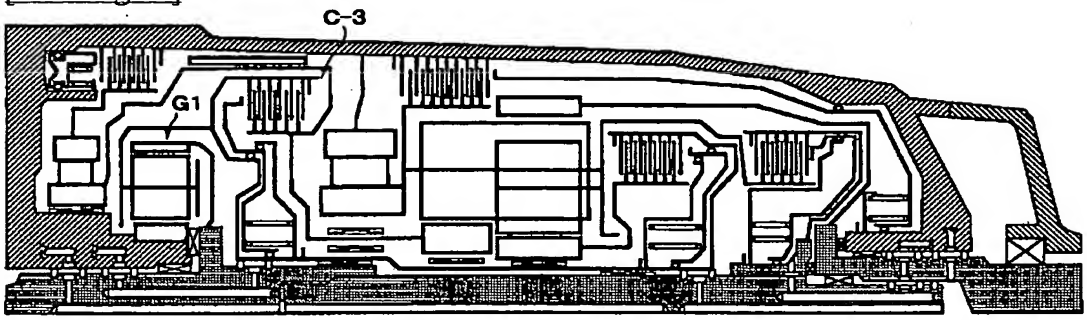
[Drawing 9]



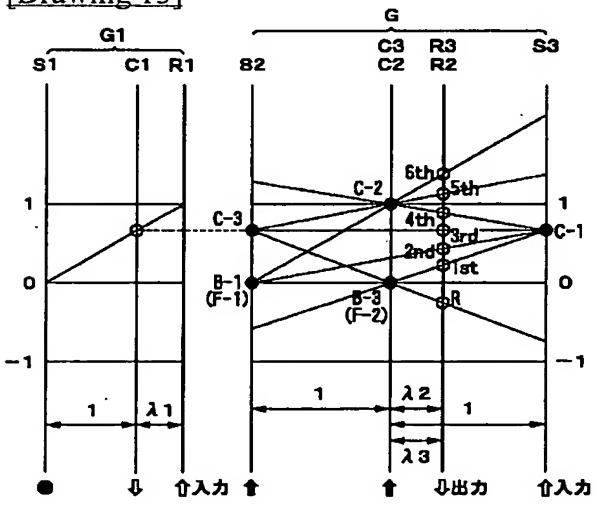
[Drawing 10]



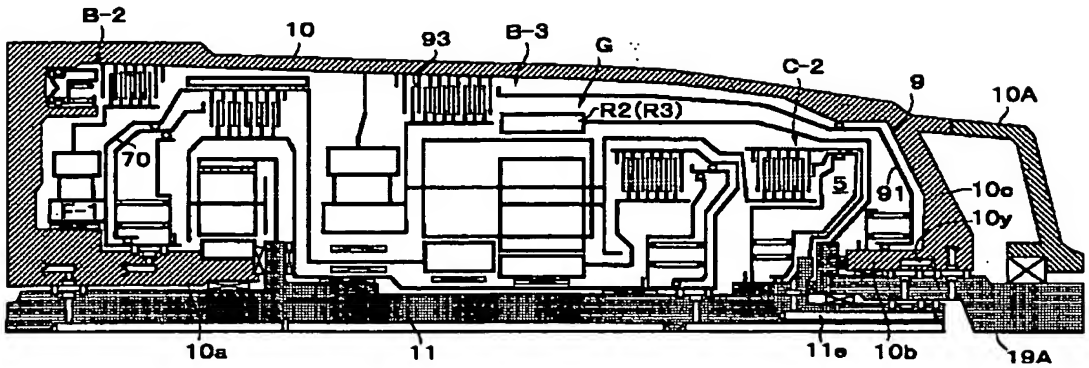
[Drawing 15]



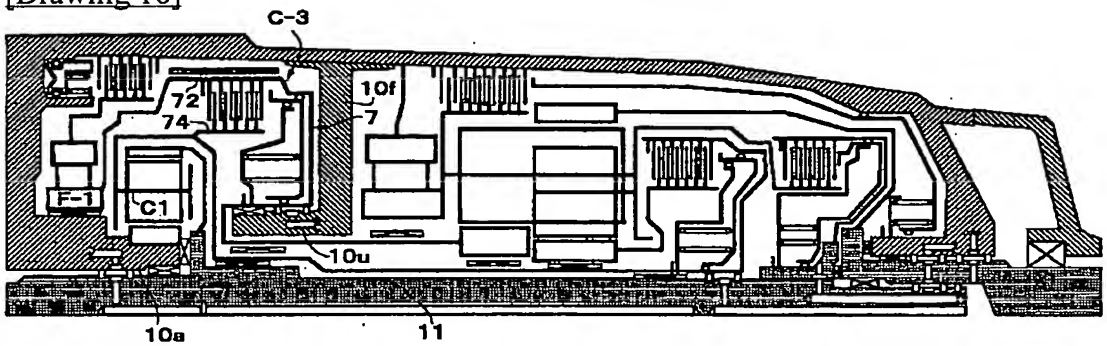
[Drawing 13]



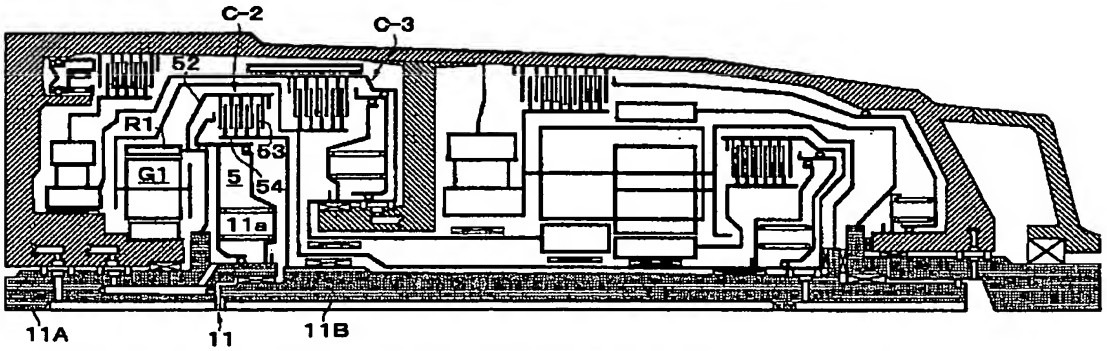
[Drawing 14]



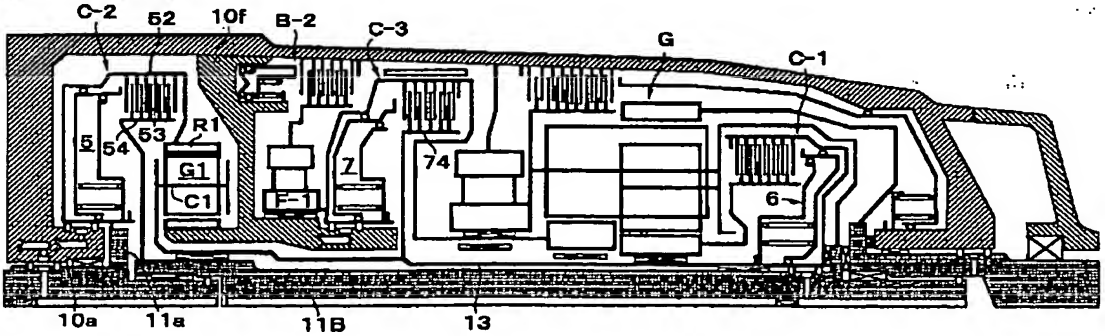
[Drawing 16]



[Drawing 17]



[Drawing 18]



[Translation done.]